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Brief Communication

## Anxiety and depression symptoms among children before and during the COVID-19 pandemic

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## ABSTRACT

**Purpose:** The COVID-19 pandemic caused disruptions to children's daily lives due in part to stay-at-home orders and school closures, reducing interactions with both peers and extended family. Yet, few studies with nationally representative data have explored the potential association of the COVID-19 pandemic and children's mental health.

**Methods:** The current study analyzed data from the 2019 and 2020 National Health Interview Survey (NHIS) to describe changes in the prevalence of symptoms of anxiety and depression before and during the first year of the pandemic among children aged 5–17 years. Changes in prevalence by child- and family-level characteristics were also examined.

**Results:** During the COVID-19 pandemic, nearly one in six children aged 5–17 years had daily or weekly symptoms of anxiety or depression, a significant increase from before the COVID-pandemic (16.7% (95% CI:15.0–18.6) versus 14.4% (95% CI:13.4–15.3)). Males, children 5–11 years, non-Hispanic children, children living in families in large metropolitan areas, incomes at or below the federal poverty level, and whose highest educated parent had more than a HS education, also showed statistically significant increases in anxiety and depression symptoms.

**Conclusions:** NHIS data may be used to monitor this increase in mental health symptomatology and assist in identifying children at risk.

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## Introduction

Between March and April 2020, mandatory stay-at-home orders and school closures were implemented widely across the country in response to the COVID-19 pandemic [1]. Many children experienced reduced time with friends and extended family, placing them at risk for poorer mental health [2]. Although recent studies have demonstrated an increased prevalence of depression and anxiety symptoms among children both within the U.S. and globally during the COVID-19 pandemic [3], representative samples in the U.S. have been lacking. This study estimates the prevalence of anxiety and depression symptoms among U.S. children and adolescents

before and during the first year of the COVID-19 pandemic using data from the National Health Interview Survey (NHIS). Given previous research has identified notable relationships between both anxiety and depression and sociodemographic characteristics [4,5], the current study additionally explores changes in the prevalence of anxiety and depression symptoms stratified at the child and family level.

## Methods

## Data source

Data from the 2019 and the 2020 National Health Interview Survey (NHIS) were used for the current study. NHIS is a nationally representative survey of the U.S. civilian noninstitutionalized population. Interviews are conducted in-person, continuously throughout each calendar year. Within each sampled household, basic demographic information is collected for everyone on the household roster. If present, one sample child under the age of 18 years is randomly selected and a parent or guardian who is knowledgeable

**Abbreviations:** NHIS, National Health Interview Survey; NCHS, National Center for Health Statistics.

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and responsible for the child's health answers questions about the child. All parents or guardians provided verbal consent.

Additional details about the NHIS can be found here: [https://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Dataset\\_Documentation/NHIS/2020/srvydesc-508.pdf](https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2020/srvydesc-508.pdf)

It should be noted that the 2020 NHIS sample size was reduced due to interruptions to data collection as a result of the COVID-19 pandemic, which included greater reliance on telephone interviewing [6]. Weighting procedures accompanied with a bias assessment allowed for the creation of comparable samples between time periods [7].

## Measures

### Anxiety and depression

Questions about the frequency of anxiety and depression come from the Child Functioning Module (CFM) [8–10], a 24-item scale developed by the Washington Group on Disability Statistics in collaboration with the United Nations Children's Fund (UNICEF). Questions on the CFM were cognitively tested internationally across six countries and were designed to capture a child's functional status, reflecting advances in the conceptualization of disability using the World Health Organization's (WHO) International Classification of Functioning, Disability, and Health [11]. Parents are asked separately to report on the frequency with which their child seems "very anxious, nervous, or worried" and "very sad or depressed" with response options of "daily," "weekly," "monthly," "a few times a year," or "never". For this study, children were categorized as having current symptoms of anxiety or depression based on a frequency response of "daily" or "weekly" to either question. These questions are included in a module for children 5–17 years of age which focuses on the domains of seeing, hearing, mobility, dexterity, self-care, communication, learning, cognition, affect, playing, behavior, and peer relationships.

### Demographic characteristics

Select demographic characteristics were explored at both the child and family level. These included the child's sex, age (broken into age groups of 5–11 and 12–17 years), race and Hispanic origin (non-Hispanic White, non-Hispanic Black, non-Hispanic other, Hispanic), urbanization level [12] (large central or fringe metropolitan, medium or small metropolitan, nonmetropolitan), family income as a ratio of the federal poverty level (FPL) (<100%, 100%–199%, ≥200%) (imputed when missing), and highest education for any resident parent (high school or less, Associate degree or some college, Bachelor's degree or higher).

### Statistical analysis

First, demographic characteristics of children were compared pre-COVID-19 (January 2019–February 2020) and during the COVID-19 pandemic (March–December 2020) to ensure comparability between time periods using chi-square tests. Next, changes in the prevalence of symptoms of anxiety or depression pre-COVID-19 pandemic (January 2019–February 2020) and during the COVID-19 pandemic (March–December 2020) among children aged 5–17 years were evaluated using two-sided z-tests ( $P < .05$ ) ( $n = 11,038$ ). Estimates were stratified by select demographics (sex, age, race and Hispanic origin, urbanization level, family income, highest education for any resident parent). Finally, unadjusted (Model 0) and adjusted (Model 1) logistic regressions were run. The adjusted model was used to determine if select demographics accounted for the prevalence change seen in anxiety and depression symptoms between time periods. All analyses, including calculating point estimates and standard errors, accounted for the NHIS complex sample design [13]. All analyses were conducted using Stata 17.0 [14].

FPL was calculated using the U.S. Census Bureau's poverty thresholds for the previous calendar year, which considers family size and age. Missing family income (17.5%) was imputed using family income bracket responses or other survey information [15]. Missingness on remaining covariates were less than 3%.

The NHIS sample design allows for monthly nationally representative estimates, permitting the comparison of individual months within the same quarter or across years. NHIS protocols are reviewed and approved by the NCHS Ethics Review Board prior to survey implementation and data collection.

## Results

Table 1 presents the demographic composition of the childhood population before and during the COVID-19 pandemic. No significant differences were found at the child (age, sex, race and Hispanic origin) or family (urbanization level, income, education) level by time period.

In the United States, children ages 5–17 years were more likely to have symptoms of anxiety or depression during the COVID-19 pandemic than before the COVID-19 pandemic (16.7% vs. 14.4%) (Table 2).

### Child-level

Statistically significant increases of greater than two percentage points were observed for younger children (5–11 years), males, and non-Hispanic White children (Table 2). Nonsignificant increases of similar magnitude were observed for Hispanic children.

### Family-level

Statistically significant increases of greater than two percentage points were observed for children living in large metropolitan areas, those with family incomes at or above 100% but less than 200% of the FPL, and those with the highest educated parent having more than a high school (HS) education. Nonsignificant increases of similar magnitude were observed for children living in medium or small metropolitan areas and with family incomes at or above 200% FPL. Nonsignificant decreases of similar magnitude were observed for children living with family incomes below 100% of the FPL, and with the highest educated parent having a HS degree or less. There were no statistically significant decreases.

In the unadjusted logistic regression (Model 0), the odds of daily or weekly symptoms of anxiety or depression were 1.2 times greater during the COVID-19 pandemic than before (OR = 1.20, 95% CI: 1.04–1.38,  $P < .05$ ) (Table 3). After adjusting for select demographics (Model 1), this association remained with comparable magnitude (AOR = 1.21, 95% CI: 1.05–1.39,  $P < .05$ ).

## Discussion

During the COVID-19 pandemic, nearly one in six children aged 5–17 years had daily or weekly symptoms of anxiety or depression in the United States. The prevalence of these symptoms was higher during the COVID-19 pandemic overall, but when stratified by child and family level characteristics, the magnitude, direction, and statistical significance varied.

Timing of stay-at-home orders and the subsequent relaxation of measures used to reduce the spread of COVID-19 varied across the nation, as did mitigation measures imposed during the COVID-19 pandemic [16], including the availability of in-person learning [17]. These, coupled with variation in children's perceived disruptions to daily activities and social and family interactions, [2] along with familial attitudes, beliefs and fears of severe illness [18], may

**Table 1**  
Sociodemographic characteristics of children 5–17 years of age, United States: January 2019–February 2020 and March 2020 – December 2020

	January 2019– February 2020 % (95% CI)	March 2020– December 2020 % (95% CI)	P-value
<b>Child-level characteristics</b>			
Age group			.64
5–11 y	52.8 (51.5–54.2)	52.2 (50.1–54.4)	
12–17 y	47.2 (45.8–48.5)	47.8 (45.6–49.9)	
Sex			.82
Male	50.9 (49.5–52.2)	51.2 (49.0–53.4)	
Female	49.1 (47.8–50.5)	48.8 (46.6–51.0)	
Race and Hispanic origin			.92
Hispanic	25.4 (23.8–27.0)	25.9 (23.3–28.6)	
Non-Hispanic White	52.1 (50.4–53.7)	51.8 (49.0–54.6)	
Non-Hispanic Black	12.9 (11.8–14.1)	13.1 (11.3–15.1)	
Non-Hispanic other	9.6 (8.7–10.6)	9.2 (8.1–10.5)	
<b>Family-level characteristics</b>			
Urbanization level			.91
Large metropolitan	54.3 (52.4–56.3)	55.0 (51.6–58.4)	
Medium or small metropolitan	31.7 (28.9–34.6)	31.4 (27.5–35.5)	
Nonmetropolitan	14.0 (11.6–16.7)	13.6 (10.5–17.2)	
Family income			.15
<100% FPL	16.9 (15.7–18.2)	14.7 (12.7–16.8)	
100–199% FPL	22.3 (21.1–23.6)	23.6 (21.4–25.9)	
≥200% FPL	60.7 (59.2–62.2)	61.7 (59.0–64.4)	
Highest education for any resident parent			.15
High school or less	28.1 (26.7–29.5)	25.6 (23.2–28.1)	
Associate degree or some college	27.7 (26.5–28.9)	28.3 (26.1–30.5)	
Bachelor's degree or higher	44.2 (42.7–45.7)	46.2 (43.6–48.7)	

NOTE: Difference between time periods was calculated using chi-square tests.  
The NHIS sample design allows for monthly nationally representative estimates, permitting the comparison of individual months within the same quarter or across years.  
Abbreviations: CI = confidence interval; FPL = Federal Poverty Level.

**Table 2**  
Prevalence of daily or weekly symptoms of anxiety of depression among children 5–17 years, by selected characteristics, United States: January 2019–February 2020 and March 2020 – December 2020

	January 2019– February 2020 % (95% CI)	March 2020– December 2020 % (95% CI)	Percentage point difference
Overall	14.4 (13.4–15.3)	16.7* (15.0–18.6)	2.3
<b>Child-level characteristics</b>			
Age group			
5–11 y	13.1 (11.8–14.4)	15.8* (13.4–18.4)	2.7
12–17 y	15.8 (14.5–17.2)	17.7 (15.6–20.1)	1.9
Sex			
Male	13.0 (11.8–14.3)	15.8* (13.5–18.3)	2.8
Female	15.7 (14.4–17.2)	17.7 (15.2–20.5)	2.0
Race and Hispanic origin			
Hispanic	11.5 (9.7–13.5)	14.2 (11.1–17.8)	2.7
Non-Hispanic White	17.5 (16.1–19.0)	20.5* (17.9–23.2)	3.0
Non-Hispanic Black	9.2 (7.1–11.8)	9.7 (5.7–15.1)	0.5
Non-Hispanic other	11.7 (9.3–14.5)	12.8 (8.6–18.1)	1.1
<b>Family-level characteristics</b>			
Urbanization level			
Large metropolitan	13.0 (11.8–14.2)	15.7* (13.6–17.9)	2.7
Medium or small metropolitan	16.3 (14.5–18.2)	19.4 (15.9–23.2)	3.1
Nonmetropolitan	15.4 (12.7–18.4)	14.8 (9.8–21.0)	–0.6
Family income			
<100% FPL	15.6 (13.0–18.6)	13.5 (9.1–19.1)	–2.1
100–199% FPL	12.7 (10.8–14.8)	17.3* (13.3–21.9)	4.6
≥200% FPL	14.6 (13.5–15.8)	17.3 (15.3–19.4)	2.7
Highest education for any resident parent			
High school or less	13.6 (11.7–15.6)	10.7 (8.1–13.9)	–2.9
Associate degree or some college	13.9 (12.1–15.9)	20.7* (16.8–25.1)	6.8
Bachelor's degree or higher	14.9 (13.6–16.3)	17.6* (15.2–20.2)	2.7

NOTES: Parents were asked “How often does [child] seem very anxious, nervous, or worried?” and “How often does [child] seem very sad or depressed?” with response options for both questions of “daily,” “weekly,” “monthly,” “a few times a year,” or “never”. Responses were dichotomized by frequency (daily/weekly vs. monthly/a few times a year/never). The NHIS sample design allows for monthly nationally representative estimates, permitting the comparison of individual months within the same quarter or across years.

Abbreviations: CI = confidence interval; FPL = Federal Poverty Level  
\* Significantly different from January 2019–February 2020 ( $P < .05$ ).

**Table 3**  
Multivariate logistic regression models of daily or weekly symptoms of anxiety or depression among children 5–17 years of age

	Model 0 OR (95% CI)	Model 1 AOR (95% CI)
Time period		
January 2019 – February 2020	Reference	Reference
March 2020 – December 2020	1.20* (1.04–1.38)	1.21* (1.05–1.39)

NOTES: The odds ratio in Model 1 was adjusted by the child's age, sex, race and Hispanic origin, urbanization level, family income, and highest education for any resident parent.

Abbreviations: OR = odds ratio; AOR = adjusted odds ratio, CI = confidence interval

\*  $P < .05$

help explain the variation seen in changes in anxiety and depression symptoms. In particular, younger children (5–11 years of age), as a function of their age and abilities, may have experienced more disruptions (e.g., unable to connect virtually) and may be more vulnerable to poorer mental health. Further, parental coronavirus anxieties vary by demographics such as region, race and ethnicity when measured in the context of children's return to in-person schooling [19], placing some children at risk for experiencing poor mental health.

A major strength of the NHIS is the ability to generalize findings and explore differences between various subgroups. However, the current study is subject to limitations. The questions capturing symptoms of anxiety and depression were not clinically validated, although they have been cognitively tested extensively [8–10]. In addition, anxiety or depression symptoms may be underreported due to parent report [20]. It is similarly possible that elevated stress levels among parents during the COVID-19 pandemic due to challenging life circumstances [21] may influence their perceptions of their own child's mental health [22]. However, there is no evidence that the quality of parent report changed between the two periods, and the increase in the prevalence of anxiety and depression symptoms may be clinically meaningful.

As previously mentioned, the 2020 NHIS sample size was smaller than anticipated due to the COVID-19 pandemic, and as a result, statistical tests of differences had less power for some smaller subgroups. Nonetheless, these findings highlight significant variation in children's mental health symptoms by selected child and family level characteristics.

#### Future directions

The NHIS may be used for continued monitoring of symptoms of anxiety or depression throughout the COVID-19 pandemic to determine if symptoms continue to increase or stabilize among various subgroups of children. Similarly, research that explores potential predictors of mental health and well-being, including parental mental health, may provide additional insight into how anxiety and depression symptoms are experienced by children.

#### Disclaimer

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq

#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.annepidem.2022.09.003.

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